MICROWAVE
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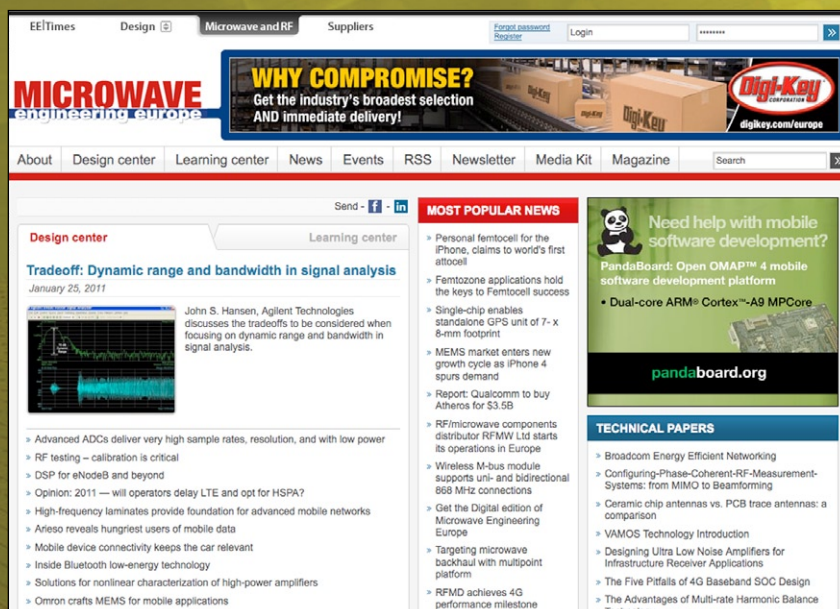www.microwave-eetimes.com

CEVA and CellGuide partner to offer software GPS solution

CEVA, Inc., and CellGuide have announced a partnership to offer a software-based GPS solution for the CEVA-XC communications processor. Leveraging CellGuide's GPS/GLONASS software IP, CEVA-XC licensees can add GPS capability to their processor designs without any hardware modifications or increase in die size.

CEVA-XC is a high-performance, scalable, low-power communication DSP designed specifically to overcome the stringent power consumption, time-to-market and cost constraints associated with developing high-performance Software Defined Radio multimode solutions.

It supports multiple air interfaces for various applications.

The software-defined nature of the processor enables it to easily perform the intensive GPS computations, completely in software, eliminating the need for dedicated GPS baseband hardware within any CEVA-XC based SoC design. CellGuide's GPS/GLONASS software is specifically architected for integration into mobile processors and can run concurrently with other air interfaces allowing true SDR modem design.

www.ceva-dsp.com, www.cell-guide.com

WiGig shows progress with 60 GHz specifications

The Wireless Gigabit Alliance has announced progress setting 60 GHz standards, but its final specifications will not be released for about a month. The group is garnering praise from chip and systems makers as the future for a broad set of applications including Wi-Fi and wireless docking and displays.

WiGig published a version 1.1 of its MAC/Phy specification, cleaning up issues implementers found in the original draft and enhancing its preamble sequence and beam forming technology. The techniques can carry data at rates from 3 to 7 Gbits/second.

The group also published to adopters a so-called WiGig Bus Extension that essentially defines an adaption layer for running PCI Express on top of its 60 GHz technology. It expects to finish before the end of the year an adaption layer for USB it calls the WiGig Serial Extension.

WiGig is hopeful it can forge links with the PCI Special Interest Group and the USB Implementers Forum once the final 60 GHz specs are published in a few weeks. The deals could open the door to creating official certification programs for wireless USB and PCIe.

So far, WiGig has struck a relationship with the Video Electronics Standards Association and become a member of HDMI Licensing LLC so it can eventually release wireless adaption layers for DisplayPort and HDMI.

Last year, WiGig forged a deal with the Wi-Fi Alliance so its 60 GHz approach can be certified as a future generation of Wi-Fi. The group has aligned its technical approach with the existing IEEE 802.11ad standards effort on 60 GHz, said Ali Sadri, chairman of WiGig.

WiGig could have a certification program for its MAC/Phy spec ready in about a year. That would form the basis for certification programs for the higher layer protocols to follow in another six to 12 months.

Eight test companies—including Aeroflex, Hittite Microwave and Rohde & Schwarz—joined the WiGig Alliance in anticipation of the certification programs. The first WiGig plugfests could be held as early as October. At least two companies—Panasonic and Qualcomm Atheros—have already announced chips for WiGig.

WiGig's 60 GHz approach "looks like the winning recipe" for next-generation wireless, said Bruce Montag, a senior technologist at Dell and a WiGig board member. Montag said the combination of 60 GHz as a follow on to today's 802.11n Wi-Fi as well as a wireless display, dock and I/O link could make the technology pervasive and compelling. "If I can do all that wirelessly, I have less need for connectors and I can make thinner, lighter systems," he said.

Separately, startups such as Amimon and Celano have developed their own high speed wireless links. However they are typically geared to specific applications.

www.wirelessgigabitalliance.org

TVs turn on as Apple, Nordic join Bluetooth

Apple and Nordic Semiconductor have joined the board of directors of the Bluetooth Special Interest Group. The companies expand the clout of the group at a time when Bluetooth is edging into TVs and medical gear.

The group hopes by early next year its 4.0 spec gets adopted by many TV makers for multiple uses including remote controls, 3-D glasses, streaming music and sharing photos and videos. "Our entry into the living room will be through the TV," said Michael Foley, executive director of the Bluetooth SIG in a press briefing.

LG, Samsung and Vizio already ship TVs using Bluetooth remote controls based on proprietary software profiles. The SIG aims to finish standard profiles for remote controls and 3-D glasses by this fall to enable a broader set of products.

The Zigbee-based "RF4CE has probably received more public attention [than Bluetooth for remote controls], but there hasn't been a huge number of [RF4CE] products shipped," said Foley. "People are finding some of interference, cost and other limitations [with RF4CE] and suddenly looking at Bluetooth 4.0," he said.
www.bluetooth.com

RF Industries to acquire Cables Unlimited

RF Industries, Ltd., (RFI) has entered into a definitive agreement to acquire privately owned Cables Unlimited, Inc., (CUI) for cash and equity consideration of approximately $5.6 million.

It is anticipated that RFI will pay approximately $2.8 million in cash and issue approximately 760,000 shares of common stock to the seller at closing. The transaction is expected to close on or about June 15, 2011.

Cables Unlimited's product line adds high value fiber-optic cabling and connector products to RFI's interconnect and wiring products.
www.rfindustries.com

Startup has ultrasound alternative to NFC

Startup Naratte Inc., has disclosed a technique for sending information via ultrasound using existing speakers and microphones in consumer devices such as smartphones. It is working with partners to enable applications such as mobile payments. The startup's technology called Zoosh is positioned as an alternative to near field communications, particularly good for enabling via a mobile application's existing systems that do not support NFC.

A company called SparkBase is already using the technology for a mobile wallet application called PayCloud. Other applications in the works include phone-to-phone and phone-to-POS payments, phone-to-POS loyalty systems, digital coupons and fast Bluetooth pairing.

The approach uses audio frequencies inaudible to humans, created using proprietary transforms and algorithms created by Naratte (pronounced to rhyme with karate). The audio is played as a standard MP3 file over a limited distance using a unique and perishable transaction ID.

The startup faces a host of challenges. It must convince third parties to adopt its technology at a time when many of the big banks, credit card companies and mobile giants are jumping on NFC. Potential partners will scrutinize closely any security scheme used for payments. To succeed, Naratte will have to build its own ecosystem and likely create at least a de facto standard around its technology. To its credit, Naratte gathered general statements of support from a handful of influential people.

"Zoosh has the potential to enable complete consumer merchant shopping experiences," said Laura Chambers, general manager of PayPal Mobile, noting the low cost of deploying the technology.

"This is one of the most creative uses of [wireless] technology that I've seen," said Matt Muse, general manager of C5000 DSPs at Texas Instruments.

"Being able to easily enable transactions among all types of mobile devices within the true proximity from each other, all done through a pure software-based solution, is incredibly powerful," said Fay Arjomandi, head of US R&D for Vodafone Group.

Naratte (Sunnyvale, CA), was founded in May 2009 and has 12 employees. It received $5 million in funding from an unnamed investor and has eight patents pending.

www.naratte.com

Mobile operators could save $560m+ in OPEX annually, according to study

Arieso has revealed statistics showing that mobile operators could potentially save more than $560m in operational expenditure annually by "powering down" redundant base stations. By analysing actual subscriber network traffic data that indicates network capacity demand, Arieso believes that around 390,000 base stations can be powered down during quiet night time periods, saving more than 3.5 billion KWh of electrical power.

Thanks to out-dated network measurement techniques, many operators have not had access to precise data that tells them exactly where and when traffic demand exists, and where and when base stations are most needed. Crucially, this information could help operators understand which base stations can be powered down and for how long, without affecting the consumer experience.

As consumer appetite for mobile data continues to rise, operators have sought to add more network capacity by deploying new base stations in densely populated areas, or busy urban zones. New base stations may help solve capacity issues during peak hours, but during the dead of night, many of these base stations become redundant – yet still consume the same amount of power.

Using actual customer usage data, Arieso monitors the real-world impact of data and voice calls in precise locations, and determines their effects on overall network performance.

Operators can use this data to simulate network capacity requirements and identify exactly which base stations can be powered down, and when, without negatively impacting user experience. By reducing power consumption when it's not needed, operating expenditure and environmental impact is significantly reduced.

www.arieso.com
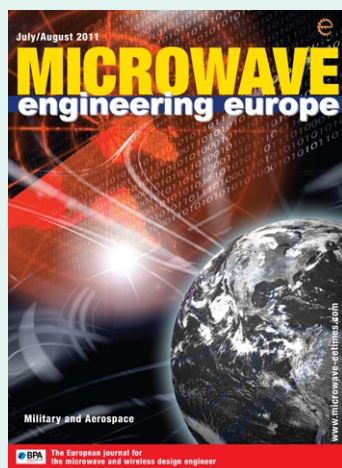
This month's cover illustrates our feature on military and aerospace. One trend here is GaN targeting radar applications as we enter a major upgrade cycle. Military communications is also advancing new technology to boost performance while reducing size and weight.

BPA
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Qualcomm backs embedded MEMS firm

Embedded MEMS developer Cavendish Kinetics Ltd., has closed a financing round of $10 million and added Qualcomm Inc., to the current investor group. Also participating in the round were Tallwood Venture Capital, Wellington Partners Venture Capital and several other current investors.

Cavendish Kinetics was originally spun out of the Cavendish Laboratory at the University of Cambridge in 1994 with a view to using MEMS as miniature mechanical memory elements. It is now focused on RF tuning and switching for mobile applications. The company is now based in San Jose, California with an additional office in s-Hertogenbosch, the Netherlands.

Cavendish Kinetics, which is a fabless chip company, said it would use the funds to produce RF tuning products based on NanoMech. Initial products targeting antenna tuners and impedance matching devices in mobile devices and are expected to sample early in 2012.

www.cavendish-kinetics.com

Wireless charging growth to surge in 2011

The expected revenue from shipments of wireless charging devices in 2011 is expected to surge by an astonishing 616 percent, according to market research firm IHS iSuppli.

The firm attributes the growth to consumers who are weary of portable electronics devices with tangled cords and cumbersome adapters and are turning to wireless charging devices, making the wireless charging market set to soar this year to $885.8 million, up more than sevenfold from $123.9 million in 2010.

However, until the industry finds a standard to follow, the wireless charging industry will be fragmented, IHS maintains, and consumers will hesitate to embrace the technology.

www.isuppli.com

Neul opens up on 'white space' radio network

Neul Ltd., has announced some more details of its first white-space radio network called Neulnet and the standard behind that Neul has dubbed Weightless. The company has said it intends to make its money partly by the control of data that passes over a potentially global "white space" network and through databases it will control, and partly by the sale of equipment and the licensing of production details relevant to the white-space M2M standard that it is now finalizing.

The company was formed in 2010 by some of the original founders of Cambridge Silicon Radio, which went on to become CSR plc on success providing single-chip CMOS implementations of the Bluetooth standard. But Neul does not intend to be a chip company, but rather a technology enabler for other companies. It's network is intended for machine-to-machine communications and to operate in the license-free and payment-free "white-space spectrum" between 400- and 800-MHz being made available by the retirement of analog television broadcasting.

Although the company is starting in the United Kingdom the company said the principles are applicable globally as just about all broadcast television is in the UHF band and just about all governments are digitizing those broadcasts creating white-space opportunities. Signals in these frequencies can travel long distances and easily penetrate walls. This makes white space radio suitable for long-range applications that require wide-area connectivity.

The simplicity of the terminal nodes is intended to provide 10 years of battery life for low data applications such as smart meters. It should also reduce chipset costs to $5 in prototype volumes and $1 in high volumes. Neul executives said they intend to sign up mainstream chip companies to make the chips.

With predictions of 50 billion M2M connections by 2020 it is clear that Neul is not going to make all the chips needed, said CEO Collier. He said it needs the likes of Texas Instruments, Qualcomm, CSR, STMicroelectronics and Broadcom to get involved. However, Collier would not confirm whether these or similar chip companies are working with Neul on the Weightless standard.

The NeulNET system, which includes a basestation unit and portable battery powered terminal, makes it easy to create white space networks that deliver up to 16 Mbps per available white space channel at a range of up to 10-km.

Neul's next steps are to confirm the system specification meets all requirements and then look to deploy trial systems during 2011, according to William Webb, CTO of Neul. Production systems will be available in 2012 while regulatory work continues to open up white space as a harmonized global frequency band world-wide.

www.neul.com

Radiocrafts and Kamstrup announce interoperability for low power metering standard

Radiocrafts AS, a leading provider of compact RF modules, and Kamstrup, a leading manufacturer and provider of utility meters, now announce interoperability for the new C-mode in prEN 13757-4:2010.

The latest C-mode ("Compact mode") has been specified to reduce the power consumption and increase the lifetime of battery operated utility meters. Kamstrup and Radiocrafts have actively taken part in the revision of the EN 13757-4, the only European Norm for wireless meter reading. This work has lead to a very efficient communication mode for battery operated utility meters.

Compared to previous modes the new C-mode offers a new physical layer with optimized data coding giving an increased throughput of more than 50% for meter transmissions and over 200% for communication to the meter. A new optimized link layer and compression of data in the application layer gives further increase in data throughput, and hence increased battery lifetime. And a new optimized encryption scheme has been implemented to increase the security of the data communication and ensure privacy of the consumer.

www.radiocrafts.com, www.kamstrup.com

Broadband vital to sustainable economic growth

I have discussed in this column, on and off, since the beginning of the economic crisis the idea that advanced communications will play an important role in bringing nations out of recession and will be key to growth in the future. In fact, this is probably why investment in 4G networks continues unabated in spite of stagnant growth.

Not only, will these high-speed networks incorporate advanced wireless technology, but also microwave and fibre optic backhaul, blurring the boundaries between what is in the ground and what is not.

Such networks will change the way we work and play, as they open up huge possibilities on the application side — one needs to look no further than the iPhone and its nascent impact on the market in such a short time to see where the future might lie.

Interestingly, the Carbon Disclosure Project (CDP) recently outlined a similar opportunity to forge sustainable economic growth in a paper titled, "Building a 21st century communications economy". According to the organisation, global oil demand is projected to grow by a fifth by 2030 (equivalent to using the entire U.S. strategic oil reserves in a month), this paper presents an alternative; creating a low carbon, low-environmental impact economy through greater investment in advanced communication networks.

Paul Dickinson, executive chairman of CDP, explains, "We are at a historic moment where nations will either enter into a contest for finite resources, where everyone is guaranteed to lose, or we can enter into a golden age of economic growth, without the serious threat of climate change, built on the enormous potential of communications. The 19th century saw massive advances in agriculture and the 20th century was defined by manufacturing. We have the opportunity to define economic growth in the 21st century by advanced communication networks where economic opportunity is not limited by time, distance, or geography."

It is forgone conclusion that 4G networks will have a huge impact on the way people go about their business and such technology will also be an indispensable part of any modern economy. Countries that adopt 4G technology today are future proofing their competitiveness and ensuring they do not get left behind.

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IBM researchers demonstrate graphene IC on SiC wafer

IBM Research claims to have unveiled the first integrated circuit fabricated from wafer-size graphene, and demonstrated a broadband frequency mixer operating at frequencies up to 10 GHz.

The analog IC consists of a graphene transistor and a pair of inductors integrated on a silicon carbide wafer, and is aimed at wireless communications.

The circuit operates as a broadband frequency mixer, which produces output signals with mixed frequencies (sum and difference) of the input signals. Mixers are fundamental components of many electronic communication systems, which serves to demonstrate the utility of this technology. Frequency mixing up to 10 GHz and excellent thermal stability up to 125 °C has been demonstrated with the graphene integrated circuit, according to the researchers.

According to the IBM research team, the development on the SiC wafer overcomes design hurdles by developing wafer-scale fabrication procedures that maintain the quality of graphene and, at the same time, allow for its integration to other components in a complex circuitry.

"While many nanotechnology breakthroughs focus on addressing the near-term shortcomings of traditional silicon microprocessors, this inno-vative research is a key milestone towards overcoming those design obstacles with a new material that delivers unique functionality beyond what can be achieved with silicon semiconductors," said an IBM Research spokesperson.

Researchers synthesized graphene by thermal annealing of SiC wafers to form uniform graphene layers on the surface of SiC. The fabrication of graphene circuits involves four layers of metal and two layers of oxide to form top-gated graphene transistor, on-chip inductors and interconnects.

The fabrication scheme developed can also be applied to other types of graphene materials, including chemical vapor deposited graphene films synthesized on metal films, and are also compatible with optical lithography for reduced cost and throughput, say the researchers.

Previously, the team has demonstrated stand-alone graphene transistors with a cut-off frequency as high as 100 GHz and 155 GHz for epitaxial and CVD graphene, for a gate length of 240 and 40 nm, respectively.

The new graphene IC breakthrough is a major milestone for IBM during its 100th year of scientific pursuits, and is also a breakthrough for the Carbon Electronics for RF Applications (CERA) program, funded by DARPA.

http://twimgs.com/eetimes/GRIC_science_0504.pdf

Alliance releases envelope tracking design IP to members

The OpenET Alliance, the not-for-profit industry organisation which aims to drive the adoption of envelope tracking (ET) power amplification techniques in the cellular and broadcast industries, has released key IP design blocks supporting the implementation of the OpenET interface. The IP is now available for free download to new and existing members.

The organisation claims that knowledge sharing is a key element in speeding the adoption of ET and believes the value of the IP outweighs the first year's membership fees. Developed in VHDL, it comes with a bit-exact simulation and test harness, allowing customisation and verification. Separate designs have been released to generate envelope reference data from baseband I/Q data for infrastructure and terminal applications. The infrastructure variant provides a digital envelope output, while the terminal variant is structured to drive a parallel DAC.

The Alliance has already released a set of W-CDMA, LTE5, LTE10 and LTE20 test waveform definitions for free download, which support repeatable simulation, measurement and comparison of transmitter performance, and are specified for use in popular EDA tools. Eight waveforms are fully defined, spanning a range of modulation types and channel configurations.

www.open-et.org

Model-based design passes muster for defense system

By Matt Behr, MathWorks

Model-based design continues to grow within the aerospace and defense industries. It is especially used in the development of certified systems and on large, multi-organizational programs.

The development of aerospace and defense systems presents unique challenges. The first challenge is managing their extraordinary scale and complexity.

Frequently, these projects are systems of systems, requiring integration of disparate dedicated elements.

Next, low production volume means that nonrecurring engineering costs are carefully scrutinized. One-time costs for research, design and development cannot be distributed over thousands or millions of units.

Finally, testing these systems can be difficult, costly and unsafe. For example, commercial and military satellites cannot be fully tested on the ground, and conducting flight tests on new aircraft is both expensive and hazardous.

Aerospace and defense organizations have long used modeling and simulation to address these challenges. Simulation technologies, including commercial tools such as Simulink, have evolved to support engineers throughout the design, development and test cycles.

Early in the design cycle, simulations are used to understand and analyze system behavior. As the functional and performance requirements of systems have evolved, so too have simulation and analysis capabilities.

Many organizations still use custom Fortran-based models in their design processes. Custom environments, while effective for their original task, can be difficult platforms on which to add modeling capabilities.

That dynamic has prompted the Organizations are looking to model-based techniques to ease the burden of standards compliance industry to turn to commercial-off-the-shelf (COTS) simulation pack-ages. An example of this evolution is the addition of discrete event simulation to Simulink. NASA and TriVector Services recently used the capabilities to analyze the impact of communication latencies on the Ares I rocket.

Having benefited from model-based design's utility in simulation, verification and production implementation, organizations are looking to model-based techniques to ease the burden of compliance with industry standards and enable integration testing via simulation on multi-organizational programs.

High-integrity programs requiring compliance with industry standards such as DO-178B (guidelines for determining whether software will perform safely in an airborne environment) present unique challenges. The increased burdens of testing and artifact generation significantly increase cost.

Model-based design helps engineers achieve certification to safety standards by supporting requirement traceability, verification and documentation. Those capabilities span multiple design stages. For example, requirements linked to models are inserted as comments in generated code. Qualification kits, available for several verification tools, can reduce the amount of manual review needed.

It is also increasingly common for organizations to adopt model-based design on large programs spanning multiple organizations. Doing so allows system-level performance to be assessed and integration issues to be uncovered much earlier in the design process. When detailed models from multiple organizations are combined, resulting models can contain hundreds of thousands of blocks. Modeling tools, such as Simulink, have evolved to meet such challenges with improved support for large-scale modeling, including support for composite models from other model files and support for signal buses.

Modeling standards are also becoming important for multi-organizational programs.

Much as coding standards were adopted to facilitate team development and sharing of source code, modeling standards are being developed to support collaboration at the model level.

For example, the "Orion Guidance, Navigation and Control [GN&C] Matlab and Simulink Standards" document describes the modeling standards and guidelines that the Orion Crew Exploration Vehicle flight dynamics team used for GN&C algorithm development. The standards provide guidelines for aspects of the GN&C models—including stylistic rules, modeling tool selection and configuration settings—that affect model readability as well as the generated code.

As model-based design evolves, it is enabling a diverse and expanding group of organizations to improve efficiency, increase reuse and meet the challenges of developing aerospace and defense systems.

About the author

Matt Behr is aerospace and defense industry marketing manager at MathWorks.

This article was originally published in EE Times' special digital issue entitled: "Military/Aerospace, Electronics enables reliable systems".

Flexible ultra-wideband channelizer offers ultimate radio receiver

By Jean-Pierre Joosting

RF Engines Limited (RFEL) is claiming to have taken a large step towards creating the ultimate radio receiver which is capable of detecting and processing signals across all of the radio spectrum, all of the time. The UK company is introducing an innovative and highly flexible, ultra-wideband, Channelizer IP core – the ChannelCore Flex.

RFEL anticipates that the ChannelCore Flex will find widespread application in areas including electronic surveillance, satellite communications and future base station architectures, where concurrent monitoring, detection and demodulation of a communication channels are required.

Channelization is a relatively straight forward signal-processing task. For example, a Fast Fourier Transform (FFT) can efficiently process a wideband signal into over 1000 channels. However, this can only be done with limitations:

- The channels all have equal bandwidths, which is inflexible and problematic when processing different types of transmissions concurrently.
- The bandwidth of individual channels is inversely proportional to the number of channels supported.
- The centre frequencies of the channels are uniformly spaced and are not independently controllable.
- There is limited control of the frequency response of the individual channels, leading to compromised stop-band and pass-band performance.
- It cannot be readily interfaced to existing hardware due to differing sampling rates and data formats.

More advanced signal processing techniques such as Weighted Over-Lap and Add (WOLA) pre-processing and hierarchical channelization using a Pipelined Frequency Transform (PFT) can overcome many of these limitations. RFEL has adopted the enhancements together with other

ChannelCore Flex will find widespread application in areas including electronic surveillance, satellite communications and emerging base station architectures.

proprietary techniques to create an ultra-wideband Channelizer that offers unrivalled performance and flexibility, enabling it to be tailored to bespoke applications while remaining hardware efficient.

ChannelCore Flex is capable of being configured to support many thousands of channels, spanning an input bandwidth exceeding 1 GHz. Importantly, these channels can have individual bandwidths that can vary by several orders of magnitude, be overlapped to accommodate broadband transmissions, and have centre frequencies and sample rates that can be independently tuneable to sub-Hertz resolution (≤ 1 Hz). The end result is a Channelizer architecture that can be configured to support concurrent monitoring of multiple channels, with bandwidths ranging from as large as hundreds of Megahertz, to as narrow as a few Hertz, delivering an overall aggregate channelized sample rate that can exceed 1 Gs/s. Unfortunately, there is no optimal, 'one size fits all,' Channelizer

architecture, as each application places very different demands on the implementation. To resolve this problem, RFEL has created an IP core that is compile and run-time programmable from a simple set of parameters derived from the user's technical specification. RFEL claims the high-performance and optimized IP core precisely offers the required level of flexibility demanded by the application, while minimising hardware cost and delivering a fast time-to-market.

"ChannelCore Flex delivers advanced features that are the culmination of over ten years of design and implementation experience," explained John Summers, RFEL's CEO. "The pedigree of RFEL in the area of channelization means that there is a very low technical risk when embarking on a new design, so customers can be confident of being 'up and running' very quickly."

For further information: **www.rfel.com**

Halographic radar 'sees' wind turbines... Astrium wins Galileo contract...Envelpe Tracking comes to US military...GaN targets radar applications...

Holographic radar employed to combat wind farm interference

Glasgow Prestwick Airport has selected Cambridge Consultants to help solve interference problems caused by wind farms. The area surrounding the airport has been identified as being strategically important to the growth of the UK wind industry, but the introduction of potentially hundreds of turbines throws up a problem with interference the airport's primary radar systems.

Many technical solutions have been assessed but it was decided that the holographic radar technology developed by Cambridge Consultants best suits the operational requirements, while offering greater deployment flexibility than currently available alternatives.

Holographic radar is a non-scanning, continuously tracking 3D radar than can reliably discriminate between turbines and aircraft based on easily observable differences in their behaviour.

Successful trials of a small scale system for the MoD in 2009 paved the way for the technology to be selected in 2010 by the UK Government's Aviation Management Board, and agreement from the wind industry's funding body, the Aviation Investment Fund Company Ltd, to offer financial support.

The commission by GPA is seen as a significant first step towards the deployment of holographic radar as a standard aviation industry wind turbine mitigation technology. In addition, the 3D plots produced are expected to integrate seamlessly with existing radar displays.

www.cambridgeconsultants.com

Harris Corporation and Tektronix Component Solutions establish strategic partnership

Harris and Tektronix Component Solutions have announced the strengthening of their long-standing relationship via the establishment of a strategic partnership agreement. The mutually beneficial relationship is intended to enhance both organizations' ability to deliver greater value to mutual customers in the defense industry and aid in the innovation of next-generation products.

For more than 13 years, Tektronix Component Solutions and Harris have worked together to develop and deliver quality, high-performance intra-aircraft communications systems for next-generation military aircraft, including most recently the F-22A Raptor and F-35 Lightning II (Joint Strike Fighter). Individual products have included multi-chip modules, fiber-optic transmitters and receivers, and electro-optic transceivers.

The agreement, in effect now, is intended to enhance collaboration, share technology and strategy development, improve program execution and, ultimately, enable greater growth for both companies. Through the agreement, the two companies will look to translate the communications expertise of Harris and Tektronix Component Solutions' microelectronics engineering skill to better meet evolving customer needs for greater performance while reducing size, weight and power.

www.harris.com
www.tektronix.com

Astrium wins $105M contract for Galileo management, control

European space company Astrium announced it will deliver the Ground Control Segment for the full operational Galileo system, Europe's global navigation satellite system, at the recent Paris Air Show in Le Bourget, France.

Astrium said it has been awarded a 73.5 million euro ($105.7 million) contract from the European Space Agency and the European Union for the Galileo Full Operational Capability Ground Control Segment.

The Ground Control Segment (GCS) covers the elements necessary to support the management and control of the satellite

constellation. Under the terms of the agreement, Astrium will then provide GCS facilities for the operation of the constellation of the navigation satellite system.

The contract, which will be led by an Astrium team out of the UK, covers the provision of a new facility at Fucino (Italy) and the expansion of the existing Ground Control Centre at Oberpfaffenhofen (Germany).

The deployment also includes the provision of a temporary GCS back-up facility at the Fucino Galileo Control Centre for the four In-Orbit Validation satellites, and the provision of two further Telemetry, Tracking and Command (TTC) stations on Réunion and Nouméa.

During the In-Orbit Validation phase, Astrium said it will also provide the initial Galileo ground segment infrastructure, including the functional elements contained at the Oberpfaffenhofen Galileo Control Centre and the two existing Telemetry, Tracking and Command (TTC) stations located at Kiruna and Kourou. Through the new contract, the UK team will be responsible for the deployment of the GCS to provide the full operational capability for the complete constellation.

The deployment of the Galileo system until its Full Operational Capability is achieved under a public procurement scheme, entirely financed by the European Union.

www.astrium.eads.net

Nujira and KCB Signal Solutions formalize partnership to support US military communications market

Nujira and KCB Signal Solutions have announced a formal partnership to support their growing US military customer base. The two companies intend to establish a joint entity whereby KCB Signal Solutions will develop and support a range of products to address the military communications market's need to upgrade to modern, high data rate waveforms and yet still meet the demanding size, weight and power requirements.

Tim Haynes, CEO of Nujira, said, "Interest in Nujira's Envelope Tracking technology by the US defense sector has reached the point where a US entity is now required to fully exploit its potential. In KCB Signal Solutions, we have found a partner with in depth knowledge and expertise in microwave and RF combined with a successful track record of supplying the US military with radio

Astrium wins $105M contract for Galileo management, control.

components and systems for over a decade. We believe a joint venture with them creates the right channel to take Nujira Envelope Tracking technology forward in the US military sector."

Nujira will license its Envelope Tracking modulator technology and Digital Pre-Distortion (DPD) technology to KCB Signal Solutions. Utilizing Nujira's NCT-T9101 Coolteq™ Flexible Development System (FDS), KCB Signal Solutions will develop high efficiency, wideband military communication radios and systems and support their customers from its facilities in Shirley, Massachusetts.

www.open-et.org
www.nujira.com

High-power, ceramic-based filters target military and homeland security markets

Skyworks Solutions has introduced connectorized, high power filters for military, homeland security, airborne and high-end commercial transceiver applications. These smaller, lighter and more portable solutions offer customers significant design benefits and flexibility when compared to the more traditional and much larger metallic-cavity filters.

In addition, Skyworks' designs offer less overall dimensions, resulting in significant space savings where high power filtering is a requirement.

The filters exceed the power handling of traditional ceramic designs and more than

meet critical demands from the military, homeland security and commercial markets.

The combined U.S. market for homeland security products and services – purchased by federal, state and local governments, the intelligence community and the private sector – will increase from $69 billion in 2010 to $84 billion in 2014, representing a compounded annual growth rate of 5.1 percent, according to the Homeland Security Research Corporation report. State and local spending ranks first with 23.7 percent of the overall market, while the U.S. Defense Department ranks second with 22.5 percent and the Department of Homeland Security ranks third with 18.3 percent of total spending.

www.skyworksinc.com

Circulators cover 2 to 4 and 7 to 12 GHz

Narda, an L-3 Communications company, has introduced the Model 4923 and 4925 circulators that cover 2 to 4 and 7 to 12 GHz respectively and are well suited for both commercial and defense applications.

The Model 4923 (7 to 12.4 GHz) has isolation of 18 dB, insertion loss of 0.5 dB, and a maximum VSWR of 1.3:1, handles 50 W peak and 25 W average RF input power, and operates over a temperature range of 0 to +55 °C.

The Model 4925 has isolation of 20 dB, insertion loss of 0.4 dB, VSWR of 1.25:1, peak RF power handling ability of 25 W and average power of 10 W, and operates over a operating temperature range of 0 to +65 °C.

Both models use SMA female connectors. The Model 4923 and Model 4925 are in stock and available for immediate delivery.

www.nardamicrowave.com/east

Nitronex claims smallest broadband 5-W PA

Nitronex has developed what the company claims is the industry's smallest broadband 5 W power amplifier. The NPA1003, a GaN PA MMIC features a 4 mm x 4 mm thermally-enhanced QFN package with RF input and output matched to 50 ohms. Highly integrated, the NPA1003 GaN MMIC only requires an external resistor and inductor to provide bias. With output power more than 5 W from 20 to 1500 MHz and typical efficiency of over 50%, the overall solution size is less than 0.25 square inches, smaller than any competing solution.

Nitronex's qualified MMIC process is based on a 28 V, 0.5 μm gate length GaN HEMT and features high voltage capacitors, air bridges, through-wafer vias, nichrome and epi resistors, and two levels of metal interconnect. A 3.5 μm plated gold top metallization results in low loss inductors, and a high resistivity silicon substrate is used which supports low loss transmission lines to over 20 GHz.

www.nitronex.com

GaN-based RF power transistors target L- and S-band radar

M/A-COM Technology Solutions has introduced a family of Gallium Nitride (GaN) RF power transistors, which targets L- and S-Band pulsed radar applications and applies the company's experience of providing both standard and custom solutions to meet the most demanding customer requirements.

The GaN on Silicon Carbide (SiC) products — offered as transistors and pallets — utilize a 0.5 micron HEMT process and exhibit attractive RF performance parameters with respect to power, gain, gain flatness, efficiency and ruggedness over wide-operating bandwidths. Featured benefits of the GaN products include high breakdown voltage,

GaN RF power transistors, which targets L- and S-Band pulsed radar applications.


superior power density, and higher and broader frequency operation than Silicon.

M/A-COM plans to release later in 2011 additional products that target applications such as L-Band radar, avionics, EW, and MILCOM, as well as general purpose devices.

Engineering samples for GaN transistors and pallets are available for qualified customers today from stock.

www.macomtech.com
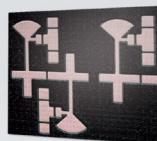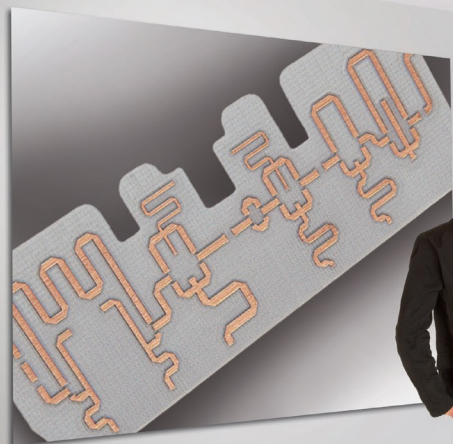
Creating stereoscopic 3-D for mobile devices

By Veera Manikandan Raju, Texas Instruments

Stereoscopic 3-D is quickly emerging as a prime technology across various markets, adding a further dimension of reality to existing 2-D videos, games, movies and images. With 3-D TVs having hit store shelves, consumers now are getting acquainted with large-screen, realistic S3-D effects in home entertainment. Today, S3-D experiences are migrating from the large screen to mobile devices, providing realistic—and glasses-free—personalized viewing experiences on the go.

Overall, S3-D video and imaging use cases can be categorized in two ways: S3-D content creation and S3-D viewing. Each poses a unique set of challenges in mobile design and development. This article offers solutions to some of the challenges and shares perspectives on how to enable successful S3-D experiences on mobile platforms.

It's important first to understand how S3-D experiences are created.

S3-D essentially adds an extra dimension to a viewing scene using left- and right-image pairs via two cameras. In games, for example, S3-D rendering refers to the positioning of virtual cameras, while for S3-D video and images, content is created using two sensors that are physically spaced apart.

The human brain is able to differentiate depth perception when both views (left and right, seen through the eyes) are rendered together. Farther objects in a given scene are seen at a distance, while closer objects are seen as closer in proximity to the viewer.

With the correct level of depth adjustments, pairs of stereo images provide the most realistic and natural user experience. Farther objects are given positive disparity, and nearer objects are given negative disparity. Accurately providing such disparity requires a reference object on which to focus; this is called a convergence plane.

In addition, human eyes see a field of view (FOV) that is dynamically variable based on where the eyes are looking, yielding a very flexible S3-D viewing experience at will.

Content creation

In order to produce such an S3-D effect, content creation needs to be done with two different camera sensors, and the left- and right-image pair needs to be processed at 60 frames/second (left and right at 30 frames/s independently).

Stereo camera pairs can be positioned in one of two ways when creating S3-D images—either in a towing angle or in a flat angle—to achieve the correct FOV. Based on the sensor characteristics, resolution and focal length, a designer will be able to decide on the best recording distance between the stereo pair. Positioning of the stereo pair is extremely crucial for getting the right convergence plane. The stereo pair can be positioned at a distance of 65 mm (like human eyes) to yield a large recording distance. In designing a smartphone or other device with similar size attributes, the designer can consider keeping the positioning at a distance of 35 mm, to achieve a personalized recording distance (1-meter to 3-meter range).

Such camera pairs, when placed on the gadgets, do not necessarily align mechanically perfectly in translational and rotational directions.

There can be minor misalignment in the millimeters while placing the sensor modules on the form factor device. Such minor variations in physical placements in translational and rotational directions can create large misalignment variations in the image plane. This imposes a huge challenge in terms of calibrating the misalignments up front and correcting the misalignment on a per-frame basis while the content is created. Furthermore, a device's
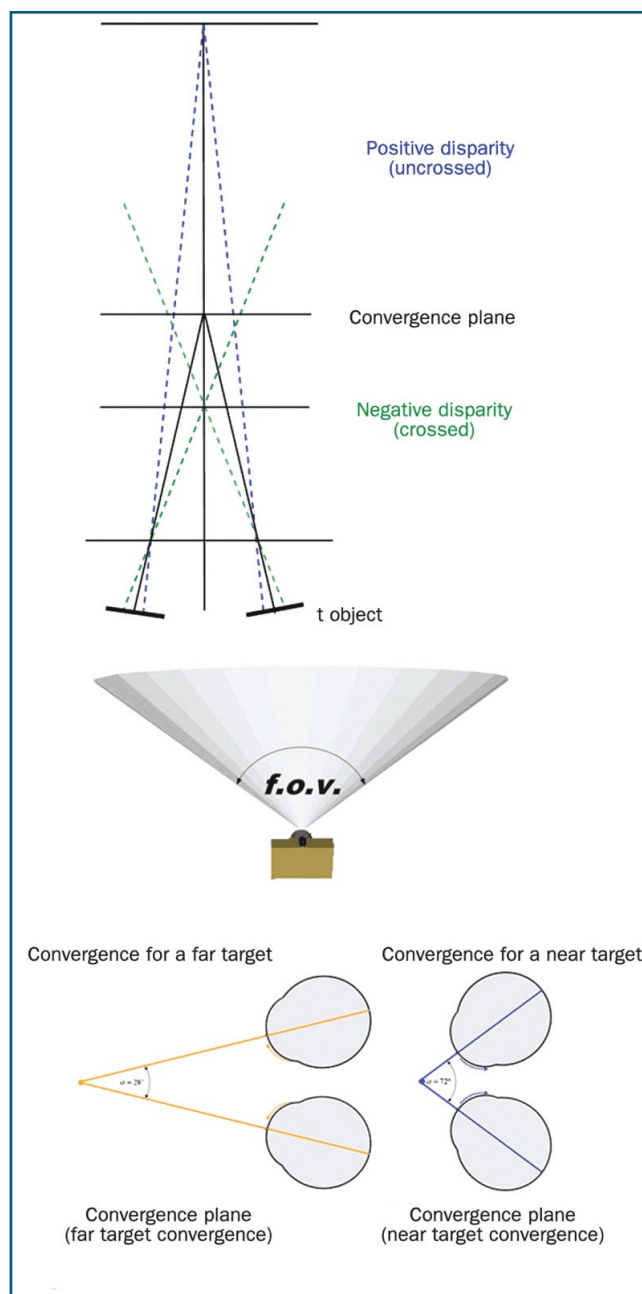
mechanical aspects—even temperature variations and the occasional falling of the gadget—can create such misalignment between the stereo pair of sensors. It therefore becomes vital to correct such variations in real-time.

Once content is created, it is important to ensure it is viewable on the target devices. System software running in the gadget should

Figure 1.

Positive disparity (uncrossed)

Convergence plane

Negative disparity (crossed)

t object

f.o.v.

Convergence for a far target

Convergence for a near target

Convergence plane (far target convergence)

Convergence plane (near target convergence)

be capable of doing the following to provide successful S3-D content viewing experiences:

• Combine the stereo image pair and process using the image signal processing (ISP) unit for the correct resolution, distortion corrections, image quality tuning and more.

• Decide the convergence plane at run-time using efficient algorithms, and create disparity vectors for the stereo pair at run-time to provide pleasing viewer experiences.

• Correct for the misalignments in translational and rotational directions at run-time between the stereo image pair, and apply the corrections offsets per frame.

• Synchronize the 3A (auto-exposure, auto-white balance, autofocus) between the sensor modules, and fine-tune the image tuning parameters.

These operations require very sophisticated hardware accelerators that can run and process the stereo pair of high-resolution images. Such accelerators are fundamental to next-generation application processors.

Through convergence and misalignment corrections, processed image pairs are passed to the video accelerators of the application processors to encode data in 3-D formats. Today's H.264 codec offers an extension to process the S3-D information using supplementary enhancement information (SEI), which describes the format and layout of the encoded S3-D scene.

Emerging standards such as Multi-View Codec (MVC) let designers encode more than two views for true S3-D effects using multiple views. MVC codecs correlate the left- and right-view pair for spatial predictions and motion estimations for effective bit rate savings while encoding. Utilizing the information between the left and right pair for effective bandwidth reduction can improve the system data usage during an S3-D video conference, for example, since users in such instances are limited by network bandwidth.

Video encoders and decoders have S3-D awareness based on the content layout. The left and right images can be formatted in multiple ways (side by side, top/bottom, interleaved [column/row] and more). Based on the formatted layout gathered, information is decoded and provided back to the display's subsystem for rendering the data in stereoscopic fashion.

Generating S3-D experiences

Stereoscopic viewing experiences can be generated in multiple forms. Two of the most popular ways to view S3-D are through LCD shutter glasses and on autostereoscopic LCD panels. Shutter glasses achieve S3-D experiences by rendering 50 percent of the rendered pictures for the left eye and the other 50 percent for the right eye. A technique called time-sequential multiplexing then alternately displays the left- and right-eye images every time the computer refreshes (draws) the screen.

Turning the shutters on the left and right lenses of the glasses using the sync signals generated from the TV creates an S3-D effec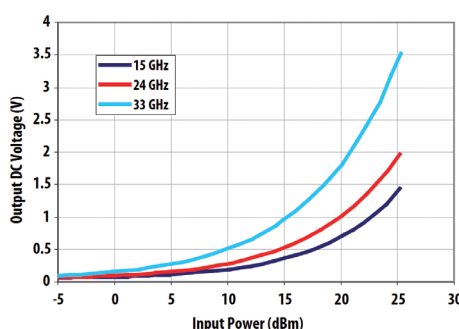t for users. It is important to realize that synchronizations need to happen very fast (faster than can be perceived) to ensure that a user thinks he or she is seeing true S3-D. That requires immense processing power on the part of the display subsystem of application processors, especially when dealing with high-definition video.

For glasses-free 3-D, autostereoscopic LCD panels display multiple views on the LCD panel. Examples of autostereoscopic displays include parallax barrier, lenticular and time-sequential LCD panels.
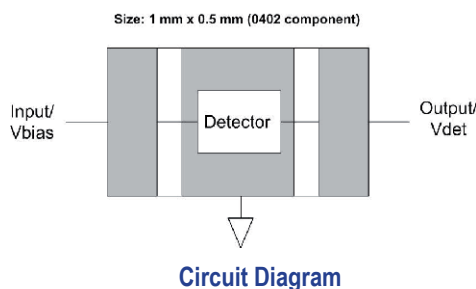
Figure 2.

Figure 2.

pixel level to format and create an S3-D viewing experiences in real-time. The display processing has to be effective at column/row/pixel interleaving for HD-resolution stereo pairs at 60 frames/s.

S3-D viewing quality poses many challenges, and it varies with respect to the size of the LCD screen and the angle at which the user is viewing the content. It is important for the created S3-D content to address convergence issues and misalignment corrections, and to enable the appropriate level of disparity in the video. If this is not done effectively, the viewing experiences can irritate human eyes.

Research continues with respect to disparity corrections, depth grading and scene ramping (changing disparity based on the scene pattern changes) to provide positive viewing experiences.

The computational power needed to run such content-creation algorithms and pixel-level display processing subsystems requires that application processors emerge to meet the needs of S3-D HD systems. Devices with immense processing power inside can provide pleasing and natural viewing experiences to users, adding the dimension for which S3-D will be known.

Keep an eye out this year for S3-D-enabled mobile devices.

About the author

Veera Manikandan Raju is engineering manager for Texas Instruments' Natural User Interface group, which is part TI's Wireless business unit. He studied at the Regional Engineering School of Trichirappalli, India.
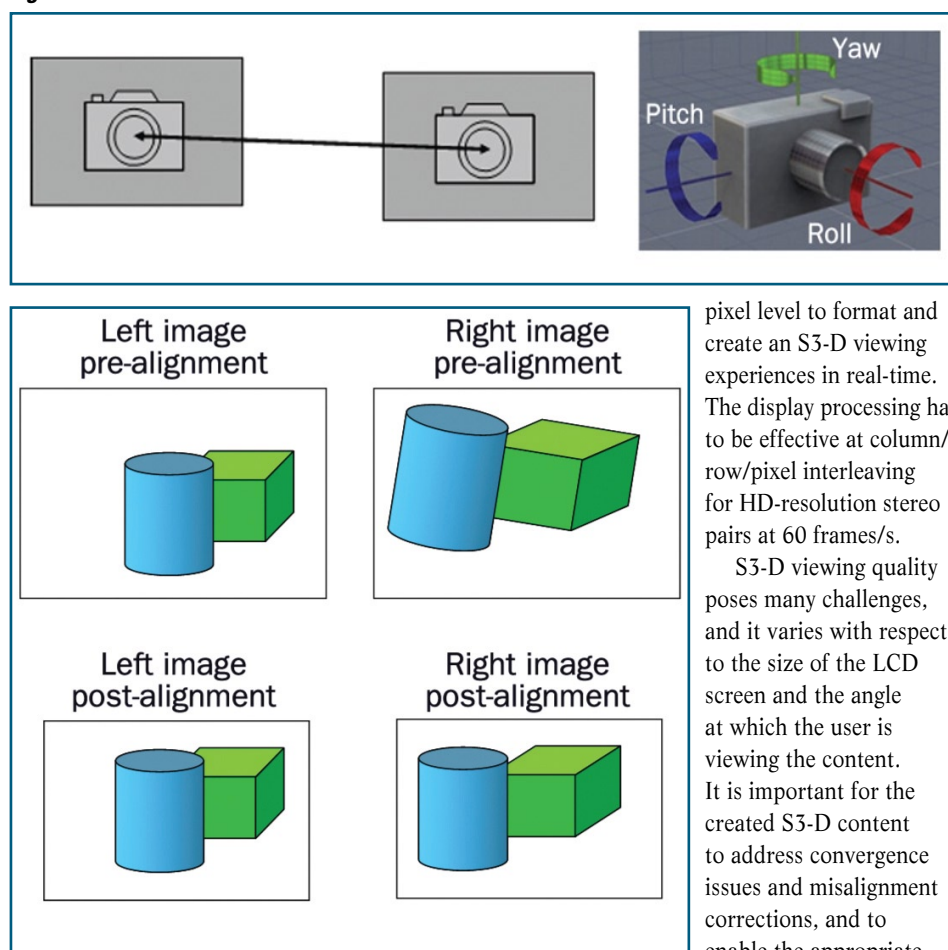
The parallax barrier, placed in front of the LCD, consists of a layer of material with a series of precision slits, allowing each eye to see a different set of pixels and thereby creating a sense of depth through parallax. The viewing angle of a parallax barrier LCD is limited, and the resolution of the pixel count is reduced by half in the horizontal direction; half the pixel count is seen by the left eye and half by the right eye.

Lenticular displays use two-dimensional arrays of lenslets designed so that when the arrays are viewed from slightly different angles, an S3-D effect is created. Time-sequential LCD panels use an S3-D film (creating an angular view of light flow through the film) in front of the LCD, controlling the backlights placed on either side of the LCD at a 120-Hz refresh rate to create a 3-D viewing experience for the users. Unlike parallax barrier LCD panels, 3-D film-based time-sequential panels produce a full-resolution S3-D experience.

Autostereoscopic panels are becoming popular in mobile devices. The panels need extensive display processing capabilities at the

Ubiquisys, Broadcom offer femtocell reference design

Ubiquisys has announced its continued collaboration with long-term partner Broadcom to develop a fully integrated femtocell home gateway. Multi-function home gateways are demanded by operators to deploy multiple services such as fixed broadband, mobile and entertainment applications from one device in the home. Femtocells transform the indoor mobile experience, but to date have been deployed as standalone devices. Integrated devices offer multi-access service providers lower cost and higher reliability while consumers benefit from multi-mode 3G/Wi-Fi connectivity with smaller form factor.

The continued collaboration between Ubiquisys and Broadcom to build an integrated femtocell home gateway breaks new ground by housing all capabilities on a single board, driving considerable cost savings, and enabling operators to offer affordable femto-integrated services.

"There's no doubt that consumers want fewer - not more - boxes in their home network set-ups," noted Peter Jarich, Service Director with Current Analysis. "At the same time, operators looking to drive femtocell adoption have a real reason to bundle femtocell functionality with other home gateway features, initially to benefit from the cost efficiencies this creates but also in providing a platform for integrated consumer services."

The low-cost single-board design is based on Broadcom's field proven integrated access devices (IAD) with features such as ADSL2+/VDSL2, 802.11n wireless LAN (WLAN), Gigabit Ethernet switching, Digital Enhanced Cordless Telecommunications (DECT) and voice over IP (VoIP). Integrated with a widely deployed, commercially proven Ubiquisys G3 series femtocell based on Broadcom's UMTS baseband processor, the design provides 8/16 calls and HSPA (14.4/5.7 Mbps) on UMTS bands I, II, IV and V and runs Ubiquisys intelligent cell software for adaptive performance and interference management.

www.ubiquisys.com

Network processor to deliver smarter 400 Gbps low power network

Alcatel-Lucent has announced a network processor that delivers a fourfold increase in performance over the fastest Internet Protocol (IP) networks available today. By supporting 400 Gigabits-per-second (G) transmission speeds, the FP3 processor opens up new possibilities for bandwidth-intensive services, applications and content, while cutting power consumption by up to 50 percent. The FP3 processor is being demonstrated today and will be commercially available in Alcatel-Lucent's service router portfolio in 2012.

The first of a new generation of IP routing technology, the FP3 processor is designed to address tomorrow's demand for ultra-high performance public and private IP networks. For example, a single FP3 processor could handle 70,000 simultaneous High Definition video streams or 8.4 million simultaneous retail cloud sessions.

Alcatel-Lucent is the first company to develop 400G technology for IP networks, helping to accelerate the adoption of 100 Gigabit Ethernet (GE), which was standardized in 2010, while providing a clear path for higher speeds in future. According to a recent forecast by Dell'Oro Group, 100GE port shipments from 2010 through 2015 are predicted to grow in excess of 200 percent annually.

"Alcatel-Lucent is showing its technology roots, recently with lightRadio™ for the wireless market and now with the FP3 400G network processor for IP routing," stated Michael Howard, Co-founder and Principal Analyst Carrier and Data Center Networks, Infonetics Research.

"I'm impressed that any company could develop such a high capacity network processor, solving 400G in the electrical domain before the industry solves 400G for lightwaves. This 400G chipset is a generational advance that will improve router 100GE density/cost and will attract the eye of service providers."

Alcatel-Lucent has also taken an industry leadership role by driving an "ecosystem" of semiconductor partners including Samsung Semiconductor, NetLogic Microsystems, Micron, GSI Technology, Cypress and Broadcom to deliver complementary components that support the transition to ultra-fast, low power networks with deterministic performance.

FP3 technical capabilities include:

- Industry's first 400G network processor;
- Supports IP routing with full range of business, residential and mobile edge services;
- Accelerates time to market for high-density 100G line card designs;
- Highly integrated design reduces overall memory requirements;
- Granular power management in 10G increments reduces overall power consumption by up to 50 percent per bit;
- Leverages existing 40 nanometer manufacturing process to reduce risk;
- FP-3 based line cards for the 7750 SR will be commercially available in 2-port 100GE, 6-port 40GE, and 20-port 10GE configurations in 2012.

www.alcatel-lucent.com/fp3
www2.alcatel-lucent.com/hln

The energy harvesting tipping point for wireless sensor applications

By Ross Bannatyne, Microcontroller Marketing Manager, Silicon Labs

Ever since the first watermills and windmills were used to generate electricity, energy harvesting has been an attractive source of energy with great potential. In recent years, energy harvesting technology has become more sophisticated and efficient, and energy storage technologies, such as supercapacitors and thin-film batteries (TFBs), have become more cost-effective. Among the final pieces in the energy harvesting solution jigsaw puzzle are integrated circuits that can perform useful functions, such as algorithmic control and wireless communications using tiny amounts of energy. We have now reached a technological tipping point that will result in the evolution of energy-harvesting-based systems from today's niche products, such as calculators and wrist watches, to their widespread use in building automation, security systems, embedded controls, agriculture, infrastructure monitoring, asset management and medical monitoring systems.

The wireless sensor node is one of the most important product types being forecast for growth as an energy-harvesting solution. Wireless sensors are ubiquitous and very attractive products to implement using harvested energy. Running mains power to wireless sensors is often neither possible nor convenient, and, since wireless sensor nodes are commonly placed in hard-to-reach locations, changing batteries regularly can be costly and inconvenient. It is now possible to implement wireless sensors using harvested energy because of the off-the-shelf availability of ultra-low-power, single-chip wireless microcontrollers (MCUs) capable of running control algorithms and transmitting data using sophisticated power management techniques.

Low-power optimization

Low-power modes on MCUs and wireless transceivers have been optimized in recent years to enable effective power management in wireless sensor applications. Figure 1 illustrates a typical wireless sensor node power cycle.

*Figure 1: Wireless sensor node power cycle.*
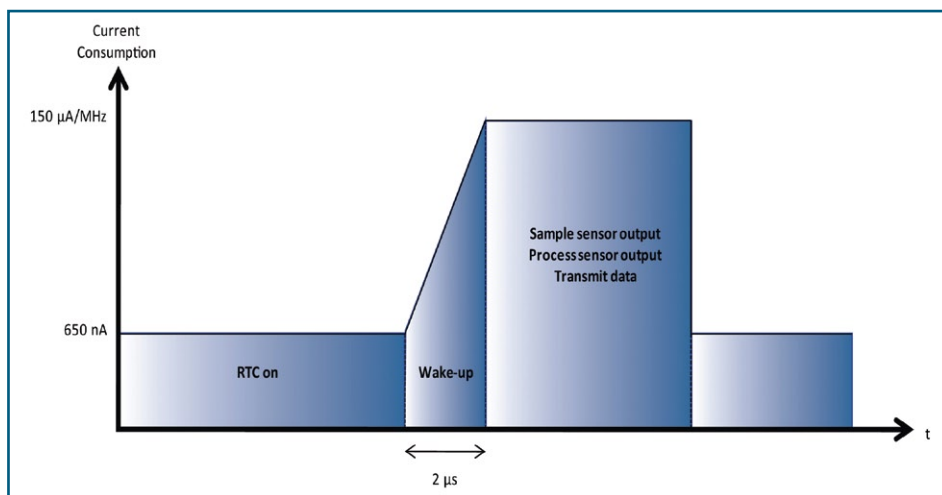
The designer's objective is to minimize the area under the curve in Figure 1, which corresponds to power consumption. Power consumption can be minimized by optimizing the relative amount of time spent in low-power sleep mode and reducing the active mode time. A fast processing core enables the MCU to execute the control algorithm very quickly, enabling a rapid return to low-power sleep mode and thereby minimizing the power-hungry area under the curve.

Wireless sensor nodes spend most of their time in sleep mode. The only subsystem that stays awake is the real-time clock (RTC). The RTC keeps time and wakes up the wireless sensor node to measure a sensor input. Low-power RTCs typically integrated onto microcontrollers consume only a few hundred nanoamps. It is important to minimize the system's wake-up time because power is consumed during this time. An RTC uses a free-running counter in the MCU timer subsystem. When the free-running counter rolls over, it generates an interrupt that wakes up the MCU often. If a 32.768 kHz crystal is used, a 16-bit free-running counter rolls over every two seconds and wakes up the MCU. If a wider free-running counter, such as a 32-bit counter, is used, the periodic interrupt occurs less often, and additional power may be conserved.

When a wireless sensor node wakes up, it is usually intended to measure a sensor signal using the analog-to-digital converter (ADC). It is important to note the wake-up time of the ADC as well as the digital wake-up time since there is little point in waking up the CPU very quickly if the ADC takes an order of magnitude longer to wake up. A low-power MCU should wake up both the CPU and the ADC in a couple of microseconds. When the sensor node is awake, the MCU current is typically approximately 160 µA/MHz. When the sensor data has been measured, the algorithm running in the MCU decides whether the data should be transmitted by the radio. To send the data, a low-power ISM band radio consumes somewhat less than 30 mA for only a millisecond or so. When this peak current is averaged out, the overall average current consumption of the wireless sensor node is in the low microampere range.

The radio transmission consumes most of the current in the system. Minimizing the amount of time the radio is on is essential to conserving energy. One way to achieve this is to avoid complicated communications protocols that require the transmission of many bits of data. Steering clear of standards with large protocol overhead is desirable when power is at a premium. It is also important

Figure 2: Typical energy harvesting system.
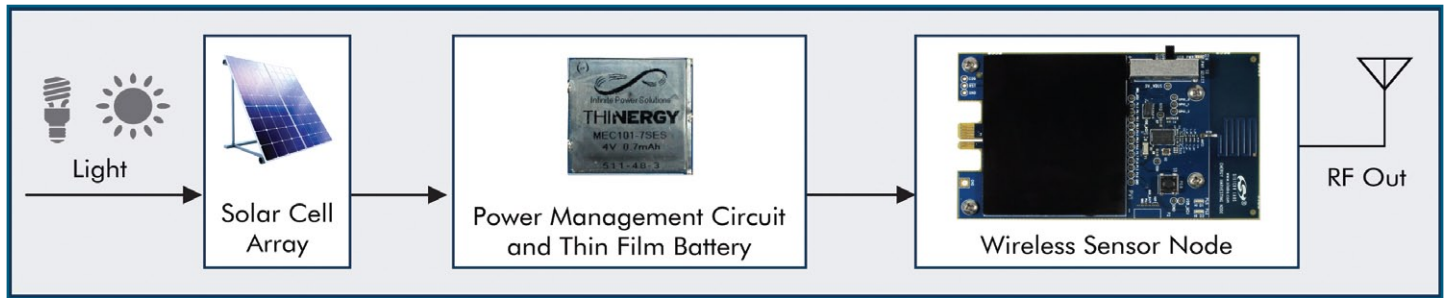
to consider the desired range. Wireless range can be traded for power consumption. An interesting approach to balancing this trade-off is to use dynamic ranging, which allows full-power transmissions when maximum energy is available but reduces the output power level when harvested energy is limited.

Another way to reduce the wireless sensor node's power consumption is to minimize the number of chips used in the system. Fewer chips on the printed circuit board (PCB) result in lower leakage current losses. Using an MCU that integrates as many functions as possible ultimately helps reduce overall current consumption. If a dc-dc converter is integrated onto the MCU, it can be switched off when the MCU is sleeping. Silicon Labs' Si10xx wireless MCU, for example, contains an integrated dc-dc converter that allows the system to be powered by a single AAA alkaline battery and still achieve 13 dB output power at the antenna. Because of its high level of integration and ultra-low power consumption, the Si10xx wireless MCUs have been used successfully in energy harvesting wireless sensor nodes.

Managing harvested energy

An important consideration in the development of an energy harvesting sensor node is to ensure that there is always enough energy available to power the system, as shown in Figure 2.

This energy harvesting system uses a solar cell array to harvest energy. A solar cell unit, such as a Sanyo AM-1815, delivers approximately 40 µA when a 200 Lx light level is available. It is reasonable to expect this level of light in an office with a window but no direct sunlight on the cell. The 40 µA of current that the array generates is fed into a power management circuit and trickle-charged into a thin-film battery (TFB). When selecting power management chips, it is necessary to pay attention to the leakage current characteristics, which are normally only a few microamperes. However, with only 40 µA coming into the

TFB, this tiny amount of leakage must be understood and accounted for. A thin-film battery, such as the Infinite Power Solutions MEC101-7SES, provides a 0.7 mAh capacity, which is a reasonable amount of energy for a wireless sensor node system. At a 200 Lx level of light, this TFB charges up fully in around 17.5 hours.

This combination of solar cell, power management and storage technologies provides an adequate level of energy for a wireless sensor node. The next important decision in the design process is the selection of a low-power MCU and wireless transceiver combination that can operate effectively from a limited energy source. A Silicon Labs Si1012 wireless MCU is an ideal choice because of its extremely low power consumption and high-performance radio characteristics. This wireless MCU uses a programmable sub-GHz ISM radio in a single-chip configuration with an ultra-low-power MCU; the highly-integrated device, which also includes an on-chip temperature sensor, is essentially a wireless sensor node on a chip.

With the hardware configured as shown in Figure 2, the control problem to be considered is how to operate the wireless sensor node at a duty ratio that does not deplete the TFB capacity that is itself being trickle-charged by the solar cell. Using the low-power design techniques discussed earlier, it is possible to reduce the average current of the wireless sensor node to around 51 µA (including power management leakage) while transmitting sensor data every second for three minutes. That is low enough to allow the system to operate and stay fully charged in minimal lighting conditions.

If the light input is reduced to 0 Lx, the wireless sensor node continues to operate and transmit for 64 hours before the TFB capacity is exhausted (assuming the three-minute transmit period is repeated every 20 minutes). A simple spreadsheet detailing expected input energy (i.e. how much light is available) versus

output energy (how often the node is required to transmit) is the only tool that a designer needs to optimize the system. If more than adequate light is expected, this energy can be used to increase the range of the transmitter. This type of system allows a range up to 300 feet, depending on the exact conditions.

Many different types of energy harvesting sources can be used to power a wireless sensor node instead of using a solar cell (or even in combination with solar energy). If a wireless sensor node is placed in a location without ready access to a light source, the node can be powered by thermal, vibration (piezoelectric) or radio wave energy harvesting sources. The power management, storage and wireless sensor node circuits are essentially the same as those used in the solar cell example. Regardless of the harvested energy source, the system design principles are the same: a limited source of energy is captured and stored in a TFB and then used to power an ultra-low-power wireless sensor node.

Summary

The ability to power wireless sensor nodes from harvested energy sources allows embedded designers to offer systems with significantly reduced cost of ownership for the end-user as well as benefits to the environment. The cost of replacing batteries housed in out-of-the-way sensor node locations can be quite significant. These wireless sensor nodes, for example, can be embedded in structures, such as buildings or bridges, or even buried underground. The three key enabling technologies needed to create self-sustaining wireless sensor nodes are readily available today: cost-effective energy harvester devices, small and efficient energy storage devices and single-chip ultra-low-power wireless MCUs. Wireless sensor nodes powered by harvested energy sources will soon become commercially viable and commonplace technologies used in our homes, offices, factories and infrastructure.

Low-noise amplifier series
deliver superior noise figure and linearity

Avago Technologies has announced an expansion of its high-performance portfolio of RF and microwave components for cellular infrastructure applications with two new series of low-noise amplifiers (LNAs). Featuring best-in-class noise performance and high linearity, the MGA-63xP8 LNAs and ALM-11x36 fail-safe bypass LNA modules deliver improved receiver sensitivity for base transceiver stations (BTS) and tower mounted amplifiers (TMA) applications.

The MGA-63xP8 devices and ALM-11x36 modules expand the company's market-leading LNA portfolio for BTS applications, which leverage the company's proprietary 0.25 µm GaAs Enhancement-mode pHEMT process to deliver low noise figure and high linearity. As opposed to a broadband approach, Avago
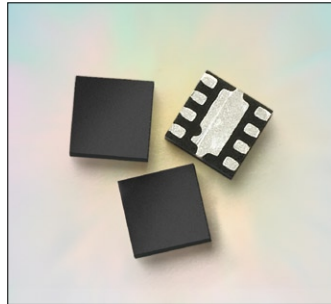
offers series of LNAs with each device optimized for superior end performance at specific frequency operation ranges. Both these latest LNA series exemplify this philosophy. Reflecting the portfolio's emphasis on integration, the ALM-11x36 modules can replace large discrete and surface-mount component counts in conventional designs, shortening design cycle time and providing board space savings.

www.avagotech.com

GaN power amplifier module
delivers high output and low distortion for CATV

Renesas Electronics has developed a gallium nitride (GaN) power amplifier module for 1-GHz CATV systems. Designed for use as a power amplifier for applications such as trunk amplifiers for CATV systems, the MC-7802 achieves high output power and low distortion that is claimed to be among the best in the industry.

The MC-7802 incorporates newly-developed gallium nitride field effect transistors (GaN FETs) that can be operated at higher frequencies and deliver higher output power than existing Renesas Electronics power amplifier module products based on gallium arsenide. The module provides approximately double

the output performance while maintaining power consumption and distortion performance at the same levels as existing products. The performance is achieved by optimizing the matching circuits of the GaN FETs and other components for CATV applications.

The GaN FETs are fabricated on a silicon substrate instead of silicon carbide, the material typically used previously — which simplifies production by enabling the use of large-diameter wafers.

The MC-7802 provides low power consumption together with improved output linearity and distortion characteristics.

www.renesas.eu

2400 MHz phase locked oscillator
DRO replacement, delivers low phase noise

The ESP-2400 phase-locked oscillator from EM Research operates at 2400 MHz and features exceptionally-low phase noise of less than -116 dBc/Hz at 10 KHz, and low power consumption.

The oscillator is supplied with an internal frequency reference, and offers +15 dBm output power and low spurs (less than -70 dBc).

Designed for ruggedized ground mobile or airborne operation the ESP-2400 also

features an extended operating temperature range (-40 °C to +85 °C), high vibration tolerance and low power consumption.

ESP oscillators are custom-designed as DRO replacements in hi-rel applications, such as SATCOM, electronic warfare and telemetry. Custom units are available in fixed frequencies from 50 MHz to 26 GHz in a connectorized DRO package.

www.emresearch.com

Compact HD radio tuner modules
automotive applications

Alps Electric GmbH offers the TDGA6 series compact HD Radio tuner modules for automotive applications that have been pre-certified by the US-based iBiquity Digital Corporation for worldwide use with its HD Radio technology.

The vertically and horizontally deployed modules have shielded enclosures with a 21 pin out and dimensions of 51.5- x 38.0- x 9.0-mm. They cover input frequency ranges on the AM band from 530 kHz to 1710 kHz and on the FM band from 87.9 MHz to 107.9 MHz. They are controlled via I2C
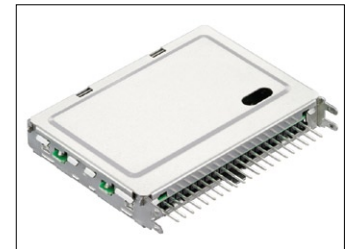
bus. The HD radio tuners are rated for supply voltages of 5.0 V or 1.2 V. The impedance of the antenna (unbalanced) is 75 Ω (FM) or 1 MΩ (AM). The modules meet the automotive temperature specifications of -40 °C to +85 °C.

www.alps.com

RF detector
for low-cost RF power monitoring

Crystek has introduced a RF power detector, the CPDETLS-4000. Encased in a rugged SMA housing, this detector is designed for low-cost RF power monitoring in general lab use.

The CPDETLS-4000 features a frequency range of 10 MHz to 4 GHz. The RF power detector is a zero-bias Schottky diode intended for use

as a large-signal power detector (greater than -10 dBm).

www.crystek.com

Integrated 1-W, 2-stage driver amplifiers
address entire cellular frequency range

Analog Devices has introduced two 1-W, 2-stage RF driver amplifiers featuring the ability to cover the entire cellular frequency range used in wireless communications systems. The highly-integrated ADL5605 driver amplifier (covering the 700-MHz to 1000-MHz frequency range) and ADL5606 driver amplifier (operating in the 1800-MHz to 2700-MHz range) provide two stages, are pin-compatible, are easy-to-tune and integrate gain, thereby saving board space when compared to traditional discrete designs.

The RF driver amplifiers integrate internal active biasing and a fast shutdown function for applications that require a power saving mode, or for applications such as wireless energy metering that transmit intermittently. The amplifiers are well-suited for a variety of wired and wireless applications including cellular infrastructure; industrial, science, and medical- (ISM) band power amplifiers; defense and instrumentation equipment.

The ADL5605 and ADL5606 provide flat gain and high output third-order intercept (OIP3) specifications across their tuned frequency range. These features eliminate the need to compensate for gain loss elsewhere in the signal chain while enabling the signal strength to be increased, without compression, prior to the power amplifier stages.
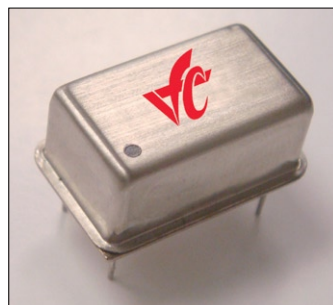
www.analog.com

High performance oven controlled oscillator
consumes significantly less power

Valpey Fisher Corporation has introduced the VFOV650, the latest addition to its OCXO product line. The OCXO provides excellent performance and utilizes Valpey Fisher's unique crystal heating system to save cost making it less expensive than conventional oven oscillators.

At 600 mW the VFOV650 consumes significantly less power than most standard OCXOs. It is built in a space-saving 13- x 20-mm package and generates frequencies up to 52 MHz. It delivers a temperature stability performance of ±10 ppb or better and has a typical phase noise floor of -170dBc/Hz.

"Today's demanding applications like IEEE1588 and Sync-E demand high performance in small packages and at an affordable price," said John Fortune, Director of Sales and Marketing at Valpey Fisher Corporation.

For more than 80 years, Valpey Fisher has been providing leading edge timing solutions and offers a complete line of high performance oven controlled crystal oscillators (OCXOs) available in industry standard packages as well as a family of low power designs.

www.valpeyfisher.com

High speed data acquisition module with multi-board synchronization for radar and UAVs

Pentek has announced its fastest-ever data acquisition module for the popular Cobalt® family. Capable of digitizing one 12-bit channel at 3.6 GHz, or two channels at 1.8 GHz, the Model 71640 nearly quadruples the signal bandwidth that can be handled on a single channel. Further, the 71640 has provisions for the synchronization of multiple boards for capture and analysis of even wider bandwidths.

Leveraging the National Semiconductor ADC12D1800 12-bit A/D converter, the 71640 provides two transformer-coupled RF input ports that can operate in single- or dual-channel mode. As with all Cobalt modules, the 71640 also includes an on-board Xilinx Virtex-6 FPGA for customer-specific data processing. The module includes four banks of 256 MB

DDR3 SDRAM and built in triggered data capture functions for acquiring precise data blocks. An optimized multi-channel DMA engine provides efficient data movement over the Gen2 x8 PCIe interface to host processors. An optional 8x, or dual 4x, gigabit serial I/O interface allows users to support application specific protocols and create high-bandwidth paths between modules or to additional signal processing engines.

Radar and broadband communications signal acquisition are prime applications for the 71640. To capture wideband signals with previous-generation A/D modules, developers needed to split those signals into smaller overlapping bands and use multiple A/Ds to digitize those bands. This created challenges whenever the target signal fell

in the overlap band. The 71640's wide bandwidth now allows system designers to eliminate the pitfalls of such overlap processing while also saving system costs of the band-splitting filters and multiple data acquisition boards.

For even wider bandwidths or for multi-channel systems, the 71640 offers a unique synchronization bus that works with a companion timing module for sample-accurate synchronization of multiple Cobalt modules.

As with other Cobalt family members, the 71640 is ready to use out-of-the-box as a fully-featured data acquisition module. Pentek's ReadyFlow board support package for the 71640 allows quick configuration

of the board's many features including a linked-list DMA engine and automatic appending of metadata and time stamps to support storage and post-capture analysis of acquired signals. In addition, the GateFlow tool provides developers with libraries and design support for implementing their own real-time analysis using the on-board Virtex-6 FPGA.

www.pentek.com

Expanded RF power amplifier portfolio
targets embedded WLAN applications

Microchip Technology has announced the expansion of its RF power amplifier portfolio, with the addition of the SST12LP17E and SST12LP18E. The SST12LP17E claims to be the smallest fully matched power amplifier in its class, requiring only one DC bypass capacitor to achieve optimum performance.

The SST12LP18E is a lower-cost, lower-voltage alternative to Microchip's popular SST12LP14E power amplifier. The device offers the lowest operating voltage of any Microchip RF power amplifier, while operating at -20 to +85 °C. The devices feature operating voltages as low as 2.7 V, linear output power as

high as 18.5 dBm at 2.5 percent EVM using IEEE 802.11g OFDM 54 Mbps, and 23.5 dBm for IEEE 802.11b and a high power-added efficiency of up to 38 percent for IEEE 802.11b.

The amplifiers come in an 8-pin 2- x 2- x 0.45-mm QFN package. The devices require no external RF matching components and need only one external capacitor, taking up less board space

www.microchip.com

Peak power analyzer
claims fastest rise time and fall time

Agilent Technologies has announced the 8990B, a peak power analyzer that offers faster measurement speed and greater measurement accuracy in peak power-pulse analysis for the aerospace, defense and wireless markets.

Complementing the 8990B are the N1923A and N1924A wideband power sensors, which cover a frequency range of 50 MHz to 18 GHz and 50 MHz to 40 GHz, respectively. When combined with either sensor, the 8990B peak power analyzer achieves 5 ns rise-time/fall-time, making the 8990B an excellent solution for RF pulse measurement and analysis.

Built for ease of use and high performance, the 8990B is equipped with a 15-inch

XGA color touchscreen that is capable of simultaneously displaying four channel results for more image detail. And with the 8990B's sampling rate of 100 MSa/s, R&D engineers get the high resolution they need to detect abnormalities in a signal trace for design improvement.

The 8990B comes with 15 predefined pulse parameter measurements.

www.agilent.com

Plastic packages for RF power transistors

NXP Semiconductors has launched a line of overmolded plastic (OMP) RF power devices with peak powers from 2.5 to 200 W. These OMP devices have been introduced as a complement to NXP's products in ceramic packages, providing customers a choice for more cost-sensitive applications, while maintaining RF performance. The OMP roadmap covers all high-volume frequency ranges and applications: 10- to 500-MHz ISM, 470- to 860-MHz broadcast, 700- to 2200-MHz GSM, WCDMA telecom, 2300- to 2700-MHz LTE telecom, 2.45 GHz ISM, and even products for the 2700- to 3500-MHz S-band. Product types will extend to all existing categories: discrete pre-drivers (2.5 to 10 W), drivers (20 to 45 W), MMICs (20 to 60 W), finals (50 to 200 W) and integrated Doherty devices (50 to 110 W).

www.nxp.com

4G/LTE capable USB router
with support of up to 65 Mbps

DOVADO TINY claims to be the world's smallest 4G/LTE capable USB router, measuring only 20-mm x 58-mm x 87-mm. It is designed for use in,home, office, vehicle or M2M (Machine-to-Machine) environments.

Mobile broadband connectivity for the DOVADO TINY is supplied via USB dongle, allowing subscribers to use their service on the move as well as a fixed broadband replacement. Furthermore it also allows them to upgrade the mobile broadband modem whenever a new model is made available. The router features an Ethernet LAN port, a WAN port for DSL failover and the latest 802.11n WLAN standard.

One of the strongest features of this USB router is its high throughput 4G/LTE capabilities with support of up to 65 Mbps. It also has the industry-unique ability to re-power the inserted USB modem in order to prolong the uptime of the Internet connection. In all, it supports over 140 different USB modems currently offered worldwide, with nearly two dozen models capable of 21 Mbps or 42 Mbps using 3G networks as well as 4G/LTE.

Not only is the DOVADO TINY a very price-competitive product which fills the gap between USB modems and local area network routers, it is also simple to configure and resilient both in its stability and performance. It retains its connection around-the-clock using the DOVADO Connection Tracker™ which is able to automatically reset the USB modem where necessary.
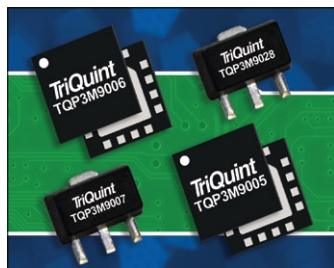
www.dovado.com/TINY

Broadband BTS LNAs
deliver flexibility and simplify RF design requirements

TriQuint's latest low noise amplifiers are part of a wide-ranging portfolio created to provide flexible, highly-efficient linear solutions for broadband markets including mobile network base stations, repeaters, point-to-point radios, test and other high-performance applications.

Available in cost-effective standard surface-mount packages, these cascadable 50 Ohm low noise amplifiers consume as little as 50 mA of electrical current and offer a variety of gain options from 15 to 19 dB. They all operate on a single positive power supply (3 V to 5 V) and are unconditionally stable.

The TQP3M9005 has a low 0.8 dB noise figure and provides 15 dB gain at 1.9 GHz; P1dB RF output is 22.3 dBm; OIP3 is 34 dBm; and electrical current consumption (Idd) is 50 mA.

The TQP3M9006 has a low 1.0 dB noise figure and delivers 13.5 dB gain at 1.9 GHz; P1dB RF output is 22.4 dBm; OIP3 is 38.5 dBm; and electrical current consumption (Idd) is 90 mA.

The TQP3M9007 gain block operates with a low 1.3 dB noise figure while delivering 13 dB gain at 1.9 GHz; P1dB RF output is 23.6 dBm; OIP3 is 41 dBm; and electrical current consumption (Idd) is 125 mA.

The TQP3M9028 has a low 2.0 dB noise figure and provides flat gain (±0.2 dB) across a wide bandwidth; it delivers 14.7 dB gain at 1.9 GHz. The device's P1dB RF output power is 21 dBm; OIP3 is 40 dBm; and electrical current consumption (Idd) is 85 mA.
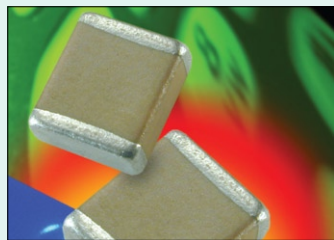
www.triquint.com

High power surface mount capacitors
deliver high-frequency performance

AVX has expanded its HQ series MLC surface mount RF power capacitors to include P90 dielectric versions for high power high frequency applications, such as medical and industrial electronics. The MLC with the P90 dielectric material features an ultra-low equivalent series resistance (ESR) and dissipation factor at high frequencies. The HQ capacitor with P90 dielectric is currently available in C case sizes, with E case sizes available in the third quarter.

The HQ series power capacitors are designed for 300 V to 7200 V applications and feature a dielectric strength of 120 percent of rated WVDC. The devices can handle the high power and high voltage levels of RF power amplifiers, inductive heating, high magnetic field environments (MRI coils), and medical and industrial electronics.

www.avx.com

Power optimised audio streamer
for cost-effective mono wireless audio

Nordic Semiconductor ASA has announced the nRF2460 audio streamer IC that offers class-leading power optimization and performance specifically for cost-sensitive battery-powered mono (single channel) wireless applications such as microphones, subwoofers, musical instruments, and gaming.

Developed in close collaboration with premier digital audio converter specialist AKM Semiconductor, Inc., the Nordic nRF2460 delivers a unique combination of crystal clear uncompressed 16-bit PCM digital audio, audio latency as low as 22 ms, a battery operating lifetime of up to 100-hours from two AAA prime cells, and low cost.

In operation, a 4 Mbps 2.4 GHz radio combined with an optimized adaptive frequency (AFH) hopping protocol and unique audio Quality of Service (QoS) engine enable the nRF2460 to maintain robust wireless audio co-existence, even in challenging RF environments that include other common 2.4 GHz interference sources such as Wi-Fi and Bluetooth wireless technology. The nRF2460 includes smart retransmission of lost packets and minimal audible effects from lost data. The device's 4 Mbps bandwidth also provides ample space to support an auxiliary wireless data channel for user control functions such as mute and volume up/down.

www.nordicsemi.com
www.akm.com

Next-generation RF generators
high-voltage, high-power

Microsemi has announced a design guide for developing next-generation high-voltage, high-power systems based on the company's unique digital radio frequency (DRF) family of hybrid modules.

These systems are used in applications including semiconductor processing, LCD glass coating, solar cell manufacturing, optical device and architectural glass coating, hazardous gas treatment, CO_2 laser excitation, MRI RF amplifiers, RF scalpels and induction heating systems.

The modules combine RF driver ICs and power MOSFETs in a single, high-performance package capable of delivering 1 to 3 kW of power at frequencies up to 40 MHz. The design guide also provides system developers with RF design techniques related to component selection, matching network design, output power optimization, efficiency maximization, cooling and packaging, as well as detailed recommendations related to circuit topologies required for building a complete RF generator.

The DRF product family combines up to two RF drivers ICs, two RF power MOSFETs and associated decoupling capacitors in a single package. The close proximity of the driver IC and MOSFET greatly reduces circuit inductance, while improving performance as compared to alternative solutions using discrete components.

www.microsemi.com

Digitally tunable capacitors enable frequency-agile tunable networks

Peregrine Semiconductor has announced the RoHS-compliant PE64904 and PE64905 DuNE™ Digitally Tunable Capacitors (DTCs). These 5-bit, 32-state digitally controlled variable capacitors provide a monolithically integrated impedance tuning solution for demanding RF applications.

The UltraCMOS™-based devices enable wide-band tunable networks, minimizing mismatch losses, improving system efficiency and reducing radio complexity for a cost-effective tuning solution. Design applications for the DTC devices range from tunable filters and matching networks to RFID, antenna tuning and other wireless communications where tunability and optimal system performance is critical.

The versatile solid-state devices can be used in Series or Shunt configurations to support a wide variety of tuning circuit topologies. Capacitance range is 0.7 to 4.6 pF in discrete 126 fF steps (6.6:1 tuning ratio) in Series configuration, and 1.1 to 5.1 pF in discrete 131 fF steps (4.6:1 tuning ratio) in Shunt configuration. The Quality Factor (Q) for a Shunt-configured DTC is ~35 for lowest capacitance state (at 1 GHz).

To address the requirements of peripheral interface programming, both 3-wire SPI-compatible (PE64904) and 2-wire I2C-compatible (PE64905) serial control versions are available. These interface options allow multiple DTCs to be controlled by a single serial interface.

Both devices are manufactured on Peregrine's UltraCMOS™ silicon-on-sapphire (SOS) process technology which optimize the devices' high RF power handling (> +38 dBm at 50 Ω, 30 Vpk RF); wide power supply range (2.3 to 3.6 V); low current consumption (typically 140 µA at 2.6 V); built-in bias voltage generation and exceptional 2 kV HBM ESD tolerance on all pins. The DTCs maintain excellent linearity: IIP2 is +105 dBm and IIP3 is +65 dBm (typical) across a wide operating range of 100 MHz to 3 GHz, and,

as with all UltraCMOS-based devices, the DTCs are immune to latch-up. The Company's HaRP™ technology design enhancements have been applied to deliver excellent harmonic performance of 75 dBc (2fo and 3fo) across the tuning range; fast 12 µs switching time; 10 µs settling time; and low-power operation (140 µA).

www.dtc.psemi.com

CALENDAR

EMC 2011
14th - 19th August 2011
Long Beach Convention Center
Los Angeles, CA, USA
http://emc2011.org

IBC 2011
8th - 13th September 2011
RAI Amsterdam
The Netherlands
www.ibc.org

Wireless Technologies 2011
27th - 28th September 2011
Schwabenlandhalle
Stuttgart-Fellbach
Germany
www.mesago.de/en/wireless/0

European Microwave Week 2011
9th - 14th October 2011
Manchester Central
Manchester, UK
www.eumweek.com

4G World 2011
24th - 27th October 2011
McCormick Place
Chicago, USA
www.4gworld.com

Wireless Congress 2011:
Systems & Applications
9th - 10th November 2011
Konferenzzentrum München
Munich, Germany
www.wireless-congress.com

Cartes & IDentification 2011
15th - 17th November 2011
Villepinte Exhibition Center
Paris, France
www.cartes.com

Productronica 2011
15th - 18th November 2011
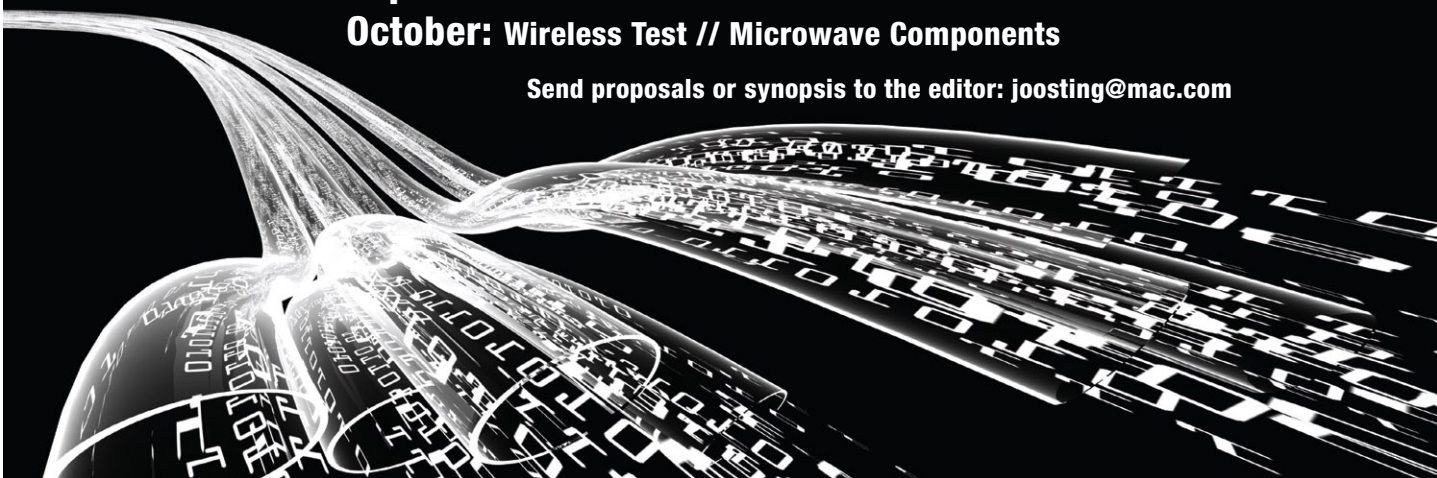**New Munich Trade Fair, Munich**
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http://productronica.com

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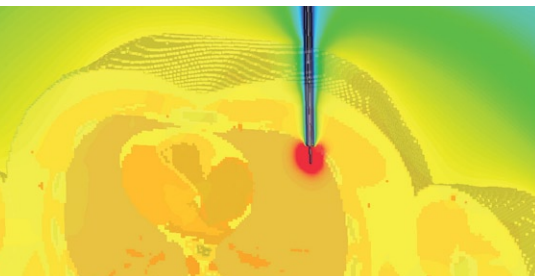**TRIDONIC**
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  - from 4pm on Saturday 8th October 2011   - Tuesday 11th October (07.30 – 17.00)
  - Saturday 8th October (16.00 – 19.00)   - Wednesday 12th October (07.30 – 17.00)
  - Sunday 9th October (07.30 – 17.00)   - Thursday 13th October (07.30 – 17.00)
  - Monday 10th October (07.30 – 17.00)   - Friday 14th October (07.30 – 10.00)

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EuMC + EuRAD	£653.00	£211.00	£849.00	£273.00
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